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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/611,490	06/30/2003	Al MacKnight	H0002000	3333

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EXAMINER	
WU, IVES J	
ART UNIT	PAPER NUMBER
1724	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/20/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/611,490	MACKNIGHT, AL	
	Examiner	Art Unit	
	Ives Wu	1724	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *12-17* is/are pending in the application.

4a) Of the above claim(s) *1-11* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *12-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *6/30/03,11/19/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

(1). Applicant's Election on Group II (claims 12-17) in the reply filed on September 28, 2006 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

(2). **Claims 12-17** are rejected under 35 U.S.C. 103(a) as being unpatentable over McNicholas (US004468234) in view of Fujii et al (US005318758), evidenced by Gustafson (US004285918), further in view of Solomon et al (US006190629B1), evidenced by Prueter et al (US006364940B1).

As to step of introducing an air flow into a carbon dioxide scrubber rotor and spraying a liquid absorbent mist into air flow in a method in **independent claim 12**, McNicholas (US004468234) discloses a centrifugal separator to clean a stream of fluid by passing the stream through a rapid rotating tapered duct (Abstract, line 1-2). In one embodiment a scrubbing liquor is sprayed into an incoming stream of contaminated air to capture entrained particles and/or

gaseous constituents (Col. 2, line 21-23). By adding a liquid which absorbs CO_2, the reaction maybe completed in a manner which would not otherwise occur (Col. 6, line 18-29).

As to step of rotating carbon dioxide scrubber rotor to separate liquid absorbent containing absorbed carbon dioxide and trace contaminants from air flow in a method in **independent claim 12**, McNicholas discloses the resultant centrifugal force on the particles and liquid droplets (mist) in the fluid stream causes rapid outward separation of denser constituents to the inner surface of wall 10 (Col. 5, line 4-7).

As to step of accumulating liquid absorbent on a 1st heat and mass transfer surface for extraction from carbon dioxide scrubber rotor in a method in **independent claim 12**, McNicholas discloses, accordingly, particles and finely divided liquid droplets collected on the inner surface of wall 10 as shown in Figure 5 (Col. 5, line 7-9). These contaminants then fall to the bottom of housing 18, collecting in the reservoir (Col. 5, line 18-20).

As to method for removal of carbon dioxide and other trace contaminants from air used in environmental control in **independent claim 12**, McNicholas discloses, in accordance with the illustrative embodiments demonstrating features and advantages, there is provided a centrifugal separator apparatus for cleansing a stream of fluid (Col. 1, line 47-50). In view of broad disclosure, it would be obvious to use patentee's invention to remove carbon dioxide and other trace contaminants from air as a method.
McNicholas discloses the scrubber liquid such as water (Col. 3, line 54) and **does not teach** the use of aqueous MEA for scrubbing liquor.

However, Fujii et al (us005318758a) teach that amine based mixture are used for CO_2 absorbent. Among them, usually MEA (monoethanol amine) is employed preferably in a form of an aqueous solution (Col.1, line 32-39).

The advantage of using aqueous MEA solution is its dual functional absorption from water and monoethanol amine in view of its chemical composition.

Therefore, it would have been obvious to use aqueous MEA solution for the CO_2 absorbent taught by Fujii et al in the centrifugal separator of McNicholas in order to efficiently remove the CO_2 as above-mentioned.

As to subsequent steps of cleaning the liquid absorbent, carbon dioxide and trace contaminants from air by further passing the scrubbed air into a liquid absorbent scrubber by

spraying an acid wash into the air flow in **independent claim 12**, McNicholas **does not teach** the further cleaning of liquid absorbent steps and rotor separator as claimed.

However, Fujii et al (US005318758A) teach the 2nd cleansing method of removing the high content of MEA absorbents of CO_2 in the scrubbed gas stream because high content of MEA corresponding to the saturation concentration thereof in the gas at such high temperature caused by exothermal absorption reaction (Col. 2, line 45-56). As evidenced by Gustafson (US004285918) that MEA solution used for CO_2 removal has several serious defects, such as evolution of ammonia, NH_3, high volatility (Col. 1, line 29-32).

The advantage of 2nd cleansing is to further remove the unwanted CO_2 liquid absorber in the scrubbed air and other contaminants.

Therefore, it would have been obvious at tine of invention to implement the 2nd cleansing method of Fujii et al after the 1st step of CO_2 scrubbing process in order to obtain the above-mentioned advantage.

Fujii et al (US005318758A) disclose the use of water for the 2nd cleansing (Col. 4, line 37-57, Col. 5, line 8-13) and McNicholas, Fujii et al **do not teach** use of acid wash for scrubbing the MEA liquid absorbent.

However, Solomon et al (US006190629B1) **teach** the scrubber liquid of an aqueous acid solution to remove water soluble and/or alkaline gases from an exhaust stream (Abstract). The alkaline gases are amines as evidenced by Dunson, Jr. et al (US003969094)- Col. 2, line 59-60.

The advantage of using acid water to absorb the alkaline gases such as MEA is to improve the capacity of absorption for the alkaline gases (Col. 1, line 46-53).

Therefore, it would have been obvious at time of the invention to use acid water of Solomon et al for the absorbent as the scrubber liquid in the 2nd contact disclosed by Fujii et al for the above-mentioned advantage.

As to the liquid absorbent scrubber rotor, Fujii et al disclose the 2nd contact by packed zone or trays shown in Figure 1 and 3. Fujii et al **do not teach** the rotor scrubber.

However, it would have been obvious at time of invention to use another rotor separator such as the one for scrubbing CO_2 disclosed by McNicholas in series to further clean the carbon dioxide absorbent as 1st choice of design because the same operations and maintenance would

apply to both the rotor scrubber, also evidenced by Prueter et al (US006364940B1), that two rotor separators are used for compact, high-efficiency gas/liquid separator (Title, Figure 5).

As to step of passing airflow downstream of carbon dioxide scrubber rotor through a plurality of 1st air passages and a plurality of 1st mist separators to a liquid absorbent scrubber rotor in a method in **independent claim 12**, it would have been obvious to have pass the air flow through 1st air passage, plurality of 1st mist separators form the centrifugal separator disclosed by McNicholas (Figure 1 and 6) to a 2nd rotor separator such as liquid absorbent scrubber rotor as the 2nd centrifugal separator of McNicholas is employed to remove the liquid absorbent in the downstream air flow from 1st CO_2 scrubber rotor.

As to spraying a liquid acid wash into the airflow, Solomon et al disclose the acid water (Abstract, line 3-6, 15-16).

As to the step of rotating to separate the liquid acid wash containing liquid absorbent, carbon dioxide and trace contaminants from air flow, accumulating the liquid acid wash in 2nd heat and mass transfer surface in a method in **independent claim 12**, the disclosure for rotating, accumulating in the 1st CO_2 scrubber motor of McNicholas would apply to 2nd scrubber rotor since they are identical.

As to step of passing the airflow through a fan to an air exhaust in a method in **independent claim 12**, McNicholas disclose as a result, the fluid of airstream leaving the conduit is a demisted, cleansed airstream. This air stream is drawn through outlet port into duct by blower. Blower exhaust the cleansed air through duct (Col. 5, line 46-50). It would apply to the design after the 2nd rotor separator of McNicholas is installed in series with 1st centrifugal separator.

As to limitation of **claim 13**, McNicholas discloses, in some embodiments, it is expected that liquid 38 in sump 38 may be decontaminated by another separator constructed similarly to that of Figure 1. In this situation, the contaminated liquid is sprayed, mixed with a stripping gas, and routed to a spinning convergent conduit to separate the cleansed liquid and deliver it to a reservoir (Col. 6,line 11-17). McNicholas further cites: The liquid absorbent in the reservoir is re-circulated through spray nozzles 30 (Col. 4, line 56-65).

(3). As to step of heating a liquid absorbent containing a carbonate to a decomposition temperature in a liquid absorbent heater in a method for reconditioning a contaminated liquid

absorbent in **independent claim 14**, McNicholas discloses, in some embodiments, it is expected that liquid 38 in sump 38 may be decontaminated by another **separator constructed similarly to that of Figure 1 (centrifugal separator)**. In this situation, the contaminated liquid is sprayed, mixed with a stripping gas, and routed to a spinning convergent conduit to separate the cleansed liquid and deliver it to a reservoir (Col. 6, line 11-17). Although McNicholas **does not teach** the heating of the contaminated liquid absorbent containing carbonate, however, it would have been obvious to heat the contaminated liquid because it is favorable condition for desorption and stripping as evidenced by McCabe (Unit of Operations for Chemical Engineering, page 571). Furthermore, it would be obvious to heat the contaminated liquid absorbent to the temperature of decomposition of the contaminants within to expedite the separation process. Although McNicholas does not teach the carbonate contaminants, it would be obvious to contain this carbonate in the liquid absorbent due to the reaction of water and carbon dioxide and MEA base.

As to the subsequent steps in **independent claim 14**, the similar centrifugal separator is used for decontamination by McNicholas (Col. 6, line 11-17). Therefore the disclosure of McNicholas discussed for instant claim 1 would apply to applicant's claim 14.

As to limitation of **claim 15**, the disclosure of McNicholas, Fujii, Solomon, Prueter et al is incorporated herein by reference, the most subject matters of communicating carbon dioxide into 2nd scrubber, washing by spraying of a cold liquid absorbent, spraying to rotating separator surface, accumulating the liquid absorbent, passing carbon dioxide through a plurality of mist separators for output from 2nd scrubber as presently claimed have been recited in applicant's claim 1, and have been discussed therein.

As to limitation of **claims 16** and **17**, it would have been obvious to further process the liquid absorbent to same 2nd scrubber for the same purpose as well as for cold liquid absorbent, although the reference did not disclose a plurality of scrubbers for decontamination, the court held that mere duplication of parts has no patentable significance unless a new and unexpected result is produced. *In re Harza*, 274 F.2d 669, 124 USPQ378 (CCPA 1960).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ives Wu whose telephone number is 571-272-4245. The examiner can normally be reached on 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Duane Smith can be reached on 571-272-1166. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Examiner: Ives Wu
Art Unit: 1724
Date: December 9, 2006

DUANE SMITH
PRIMARY EXAMINER

12-12-06